

Flexible Methane & Ethane Heat Pipes, Phase I Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)



ABSTRACT

Specific mission requirements can often require call for some degree of flexibility such as minimizing mechanical loads induced into payloads containing highly sensitive positional sensors or allowing containment of radiator panels within spacecraft fairing until deployment into fully operational positions. Flexible thermal straps and Loop Heat Pipes (LHP) are typically used for this flexible thermal link. Thermal straps are a lower technology solution for lower heat transport applications (<10 Watt) that need small mechanical displacement. LHPs can transport kilowatts of heat over long distances and have transport lines and condenser tubes that are flexible, bendable, and easily routed through complex paths. Drawbacks of LHPs include being significantly more expensive to fabricate and qualify. Flexible Constant Conductance Heat Pipes (CCHPs) can fill the gap between flexible thermal straps and loop heat pipes. The Small Business Innovative Research (SBIR) program proposed by Advanced Cooling Technologies, Inc. (ACT) will design, fabricate, and demonstrate a cryogenic flexible CCHP for a passive thermal management device.

ANTICIPATED BENEFITS

To NASA funded missions:

Potential NASA Commercial Applications: The flexible CCHP can be used in an application that requires a passive thermal control system with some degree of flexibility such as minimizing mechanical loads induced into payloads containing highly sensitive positional sensors or allowing containment of radiator panels within the spacecraft fairing until deployment into fully operational positions. The proposed concept builds upon proven technologies, and offers high reliability, minimal mass, and low power requirements.

To the commercial space industry:

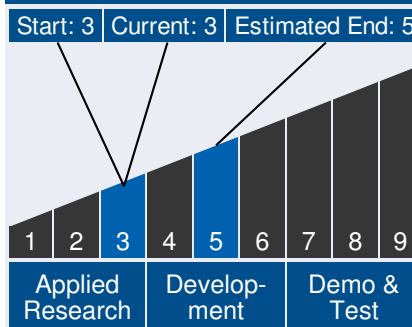
Potential Non-NASA Commercial Applications: Flexible heat pipes are of interest in a number of different applications.



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Technology Maturity



Management Team

Program Executives:

- Joseph Grant
- Laguduva Kubendran

Program Manager:

- Carlos Torrez

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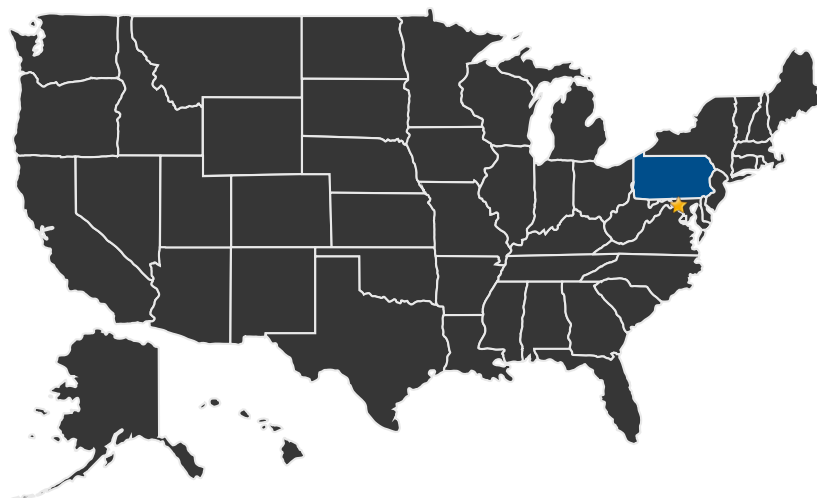
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CubeSats and SmallSats will benefit from the flexible bend, allowing deployment of radiator panels. Flexible heat pipes can also be used in terrestrial electronics, for both military and commercial applications. One example is using a flexible heat pipe to remove heat from an aircraft actuator. ACT has had a number of inquiries from customers on the availability of flexible heat pipes.

U.S. WORK LOCATIONS AND KEY PARTNERS



■ U.S. States
With Work

★ **Lead Center:**
Goddard Space Flight Center

Other Organizations Performing Work:

- Advanced Cooling Technologies, Inc. (Lancaster, PA)

PROJECT LIBRARY

Presentations

- Briefing Chart
 - (<http://techport.nasa.gov:80/file/23384>)

Management Team (cont.)

Principal Investigator:

- James Yun

Technology Areas

Primary Technology Area:

Thermal Management

Systems (TA 14)

- └ Thermal Control Systems (TA 14.2)

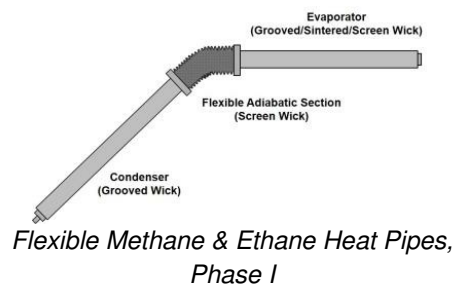
- └ Heat Transport (TA 14.2.2)

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IMAGE GALLERY



DETAILS FOR TECHNOLOGY 1

Technology Title

Flexible Methane & Ethane Heat Pipes, Phase I

Potential Applications

The flexible CCHP can be used in an application that requires a passive thermal control system with some degree of flexibility such as minimizing mechanical loads induced into payloads containing highly sensitive positional sensors or allowing containment of radiator panels within the spacecraft fairing until deployment into fully operational positions. The proposed concept builds upon proven technologies, and offers high reliability, minimal mass, and low power requirements.